



PHENIX AWARENESS TRAINING

procedure name

PHENIX Procedure No. PP-2.5.5.6-09

Revision: A

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Approvals

Don Lynch 2/5/09
PHENIX S E & I Date
DON LYNCH

Ed O'Brien 2/5/09
Cognizant Scientist/Engineer Date
ED O'BRIEN/Activity Manager

Paul Giannotti 2-5-09
PHENIX QA/Safety Date
PAUL GIANNOTTI

Yousef Makasi 2/6/09
RHIC ES&H Date
YOUSSEF MAKASI



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PHENIX S E & I Date

Cognizant Scientist/Engineer Date
/Activity Manager

PHENIX QA/Safety Date

RHIC ES&H Date

REVISION CONTROL SHEET

LETTER	DESCRIPTION	DATE	AUTHOR	APPROVED BY	CURRENT OVERSIGHT
A	First Issue (Created from latest training slides in order to maintain configuration control)	2/3/2009	P. Giannotti	D. Lynch, E. O'Brien, P. Giannotti, Y. Makdisi	P. Giannotti

PHENIX AWARENESS TRAINING

INTRODUCTION

This awareness document consists of three parts: PHENIX Access Awareness, PHENIX Fall Protection – Working at Heights, and PHENIX Skill of the Craft. As part of your introduction to the PHENIX facility you are required to read this document. Once you have completed this web document please click on the acknowledge button at the end and you will be electronically credited for taking it. You are also required to take C-AD Collider Users training to work at the PHENIX experiment in the RHIC complex.

PHENIX ACCESS AWARENESS

1. Reading and acknowledging this document alone does not qualify or certify anyone to perform work in the PHENIX Interaction Region (IR) or Assembly Hall (AH). The following general rules apply for all work in these areas.
 - Check-in is required by one or more of the following prior to work: Work Control Coordinator, Liaison Engineer, Run Coordinator or the PHENIX Shift Leader (x7821, 7815). In the absence of the above, other trained PHENIX Work Control Coordinators can be consulted. A list of the persons currently serving in these positions and contact information can be found under the Run link on the PHENIX internal web page. (<http://www.phenix.bnl.gov/>)
 - Additional job specific training may be required by BNL, C-AD, or PHENIX for electronic, electrical, gas, confined space, radiological, Laser, or other potentially hazardous work in either the PHENIX IR or AH.
 - PHENIX has a two-person rule while working in the IR area and AH. This means that no individual may perform work in these areas without another person in the vicinity and aware of the workers activities in these areas.
 - It is highly recommended to wear hard hats and safety shoes while in the IR and AH. Hard hats are REQUIRED when a crane is in operation or when anyone is working overhead. Safety shoes are required for operations with the crane, forklift and man lift. Proper shoes (full foot coverage) are always required when in the IR and AH.
2. Entry/Egress and Safety Considerations for the PHENIX IR:
 - Normal entry and exit to the IR area is permitted ONLY through the plug door when the main shielding door is closed. Normal entry and exit is NOT permitted through the labyrinth door. However, both the plug door and the labyrinth door may be used as emergency exits.
 - There is a PASS Beam Crash Cord and push button in the IR area. The crash cords are installed in each corner of the IR. They may be reached from ground level and from the platforms for the MuID, MuTr and carriages. The push button is located on the west end of the MuTr south eyebrow platform. It is also accessible from the bridge on top of the central magnet. These beam crash devices are to be actuated by a person in the unlikely event that they are left in the IR when the beam imminent alarm goes off.

- The Emergency **Power Crash Buttons** are located on the four walls of the IR, which can be activated from ground level.
- Personnel should be aware that PHENIX uses flammable gas in many of its detectors, and proper precautions should be taken, and safety rules followed.
- PHENIX has no ODH issues at this time in the AH and the IR. For PHENIX equipment located in the RHIC tunnels north and south of the IR, follow instructions on local postings. Areas there may be posted ODH0 or ODH1, both of which require specific training. In addition, ODH1 areas require medical clearance and rescue and monitoring equipment accompanying each person who enters an area so posted.

3. Potential safety hazards and fragile equipment exist in both the IR and AH.

- Electrical hazards, including both high currents and high voltages, are present in both the IR and AH.
- The PHENIX spectrometer magnets should normally be off while any work is being carried out in the IR. However, under certain conditions when the magnets are on, stray magnetic fields may be present. Work to be performed with any magnet on requires Work Planning with the Run Coordinator or Work Control Coordinator. (see 4 below).
- Fragile detector components exist in all parts of the PHENIX detector: the East and West carriages, the North and South Muon Arms, the region around the Central magnet, the large aluminum MuD panels and the areas along and around the beam pipe.
- A fragile beryllium beam pipe runs through the center of the IR. Work in the vicinity of the pipe requires work planning (see item 4).
- A Class IV laser is located in the small room in the back of the PHENIX electronics room. It is normally operated inside an interlocked safety box and does not constitute a hazard as long as the interlocked box is closed. *However, only authorized users are allowed to perform any operations with this laser, which requires additional training beyond the scope of this document.* The laser is used to deliver light on a system of fragile optical fibers to several PHENIX detectors (EMCAL, Beam-Beam and Time-of-Flight). These fibers may only be connected or disconnected by authorized and trained personnel.
- A system of optical data fibers, cables, and electronics exists in many of the electronics racks, and optical fibers run between these racks and the PHENIX Counting House. The optical fibers are very fragile; authorized personnel for equipment protection purposes should only do work in the vicinity of these fibers.

4. Much of work done in the IR may require Enhanced Work Planning (Green Permit)

Enhanced Work Planning and approval by the appropriate Work Control Coordinator may be required for:

- Working within the magnetic field posted (> 500 gauss).
- Working near the beryllium beam pipe.
- Working inside any of the PHENIX Racks. These racks have dedicated heat, smoke, temperature, and water detection systems, and work should be planned to avoid tripping these alarms.

- Working near the flammable gas and smoke detectors. Work around these systems should be planned to avoid tripping these alarms. Overhead in the IR is the HSSD smoke detection system, work should be planned to avoid tripping these sensitive systems.
- Working near Pass Cords or Emergency Crash Buttons. Care should be taken to avoid pulling the cords or hitting the buttons.
- With flammable gas in the detectors, welding, brazing or other work with open flames is not permitted without Enhanced Work Planning. Work planning is also required for the use of sparking devices, such as hand drills, heat guns, etc.
- The Crane in the IR is normally locked out when there is flammable gas present in the detectors, and requires Enhanced Work Planning to operate under these conditions.

PHENIX FALL PROTECTION / WORKING AT HEIGHTS

1. Purpose. There are several training courses offered at BNL that deal with working at heights, fall protection and the use of man lifts. There are a number of activities within PHENIX that require one or more of these training courses, along with other training, in order to carry out various kinds of work in the PHENIX (IR) Interaction Region, and the Assembly Hall (AH). However, certain routine work in the IR and AH can be performed with a minimum of working at heights training *if it is carried out within the safety systems that are in place in those areas, and with proper authorization. Working outside the safety envelope or the need for fall protective equipment requires BNL fall protection training.* The purpose of this document is to authorize those individuals who wish to perform such routine work and to familiarize them with the PHENIX specific rules that apply.
2. Responsibilities. All work in the (IR) and (AH) shall be carried out in compliance with the rules set forth in this document, and with Laboratory ES&H policies. The PHENIX "Work Control Coordinator" for the (IR) and (AH) has overall jurisdiction for all safety matters related to the work carried out in those areas. In addition, personnel shall also have the appropriate training and equipment to carry out their work safely at all times, whether the work is done at elevated heights or on the ground.
3. General Rules. PHENIX requires a two-man rule for all work done in the PHENIX IR and Assembly areas. This is especially true for working at heights above 4 ft. or on scaffolding, or when working in man lifts. Proper shoes are always required while working at PHENIX. In general if you need any kind of fall protection equipment to accomplish a task you will need to take the BNL Fall Protection training.
4. Rules for Ladders. Ladders are primarily used for access to elevated work areas or platforms, and working off ladders at heights greater than six feet is discouraged. Ladders are not to be used to circumvent the use of man lifts or platforms. Ladders must be secure and stable and used within the manufacturers recommended specifications. While on a ladder, you must maintain 3 points of contact at all times (e.g., both feet and one hand, or both hands and one foot). Carrying equipment up and down the ladder, which prevents the free use of your hands and feet, is prohibited. Carrying small hand or pocket tools in a belt or pouch is allowed.
5. Rules for Man lifts. Official BNL man lift training (course #GE-AERIAL) is required to operate man lifts. *Reading and acknowledging this procedure does not qualify anyone to operate or be a passenger in any man lifts at BNL.* In addition, operating a man lift in the IR

and AH is only permitted by certain personnel authorized by the PHENIX Group Safety Coordinator who maintains a list of the PHENIX authorized man lift operators. The operator is responsible for the safety of himself and any equipment in the vicinity of the man lift operation, and any passengers accompanying him. To be a passenger in a man lift may not require the full BNL man lift training, but passengers must take an abbreviated PHENIX Tool Box training course which consists of a 15 minute briefing, and a "hands on" exercise in the use of fall protection equipment. Man lifts may be used to carry equipment but are not to be used as a crane. The Vertical Lift (which is stationary) requires the Tool Box training to operate.

6. Rules for Scaffolds. Scaffolding is occasionally used to provide access to the various PHENIX detectors in the IR and AH. Use of scaffolding requires BNL scaffold training, available as a web-based training course on the BNL training website.

To go beyond the railings on any scaffold or platform requires BNL fall protection training and safety equipment. Access to the scaffolds shall only be made by way of the built-in ladders or stairs, which are part of the scaffold system. The general rules for ladders apply for carrying tools and equipment on all scaffold ladders. All other equipment must be hoisted or lowered to into place.

The personnel and weight limits on scaffolds and platforms must be followed!

There are weight limits and limits on the maximum number of people allowed on each of the various PHENIX platforms. These are listed below; they will also be **POSTED ON THE EQUIPMENT**. The two-man rule applies and will be enforced.

PLATFORM TOWER
There is no practical weight limit. 4 persons on each level.

CARRIAGE RACK PLATFORM
Weight limit: 1000 lbs. Each platform. Maximum number of people: 4 North and 4 South including wings.

EM-CAL PLATFORMS, BOTH CARRIAGES
Weight limit: 750 lbs. Each Platform. Maximum number of people: 3 including rack access extensions

CENTRAL MAGNET BRIDGE
Weight limit: 5000 lbs. Maximum number of people: 8

MUON SOUTH EYEBROW
There is no practical weight limit. Maximum number of people: 3

MUON NORTH CROSSOVER
Weight limit: 1000 lbs. Maximum number of people: 4

WORKER PLANNED WORK

1. Introduction. Many of the tasks necessary to maintain, repair, and debug the PHENIX detector will be carried out by Physicists (Ph.D. and graduate students). Much of this work is deemed to be within the “worker planned work” for physicists, and as such does not require additional work planning or work permits. The purpose of this document is to define which sorts of tasks fall within this “worker planned work” for physicists. (Note: previously “worker planned work” was referred to as “skill of the craft”. This designation is outdated in that it could be construed to suggest that planning would be unnecessary. Planning is always necessary. The new descriptive term now connotes that external review of the planning is unnecessary as the worker has sufficient skill and authority to plan his or her own work for this category of tasks.)

The following requirements apply to all personnel working at the Phenix experiment.

- No one person is allowed to work alone in the facility (two person rule)
 - Work will be performed only by **authorized** and **appropriately trained** personnel.
 - If tasks are not listed as “worker planned work”, consultation is required with one of the *Work Control Coordinators*, to evaluate the task.
2. Electrical. Work on electrical devices is deemed worker planned work if:

***Voltage is < 50 V AC (or DC); AND
maximum current is < 5 mA or the stored energy is < 10 Joules***

Examples of tasks allowed under this definition include:

- Removing and replacing electronic modules in PHENIX standard racks and crates as well as VME, NIM, and CAMAC crates.
- Connecting and disconnecting front panel cables (lemo, BNC, etc.) from electronics modules.
- Instruments, detectors, and data acquisition systems may be tested and analyzed using conventional diagnostic equipment such as digital multimeters, oscilloscopes, network analyzers, etc.
- Using logic analyzers to debug circuit boards.
- Using multimeters to check various currents and voltages on circuit boards.
- Using a computer (connecting and disconnecting computer to electrical outlet, connecting and disconnecting peripheral equipment to computer, turning on and off, etc.).

Examples of tasks which are **not allowed** under this definition include:

- Working with 110, 208, or 480 V AC line power sources.
- Working with exposed leads from low voltage power supplies.
- Measuring the output of the PMT High Voltage supply with a hand held multimeter.

- Any work on magnet DC power buss or buss covers.
- Any work that involves the use of the PHENIX laser that requires opening the box or disconnecting the optical fibers coming out of the box while the laser is running.

3. Mechanical. Movement of mechanical equipment around the PHENIX complex
Is allowed if:

- **The lifting of objects greater than 20 kg (44lb) shall be done by two persons. A maximum of 50 kg (110lb) may be lifted by hand.**

Examples of tasks allowed under this definition include:

- Moving computers around the facility.
- Removing crates from electronics racks (once they have been unplugged).
- Carrying diagnostic equipment (multimeters, oscilloscopes, logic analyzers, etc.) around the facility.
- * Use of the scaffold to access the racks according to PHENIX Fall Protection.

Examples of tasks not allowed under this definition:

- Operation of building cranes.
- Movement of the PHENIX carriages.
- Operation of hydraulic systems.
- Operation of forklift.
- Operation of man lifts.
- Use of rigging equipment (e.g. come-alongs, etc.).
- Use of bench mounted power tools.

Only safety rated ladders are to be used, and a second person (Two Person rule) must be present for working on Scaffolds, Platforms or Ladders at heights above 1.2 meters (4 feet).

The Work Control Coordinator must approve all operations within 1 meter of the beam pipe.

4. Work other than Worker Planned Work for a physicist

Any tasks which do not fall within the definitions given above for Worker Planned Work either:

- Require approved procedures, and the individual(s) performing the task have been trained, and authorized.
- Require further work planning. For PHENIX it is the Work Control Coordinator in conjunction with the Liaison Engineer performs this work planning.

Examples of tasks that require further work planning are:

- Modifications to facility air, gas, or water systems
- Installation, modification, or upgrade of new or existing detector systems, or installation of electrical cabling except as required in trouble shooting and short term repair as covered under this document.